

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: ME308

Course Name: COMPUTER AIDED DESIGN AND ANALYSIS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks.

Marks

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| 1 | a) Discuss the steps in conventional design process. | (3) |
| | b) In which of these steps in design, computerisation is possible and how? | (4) |
| | c) List three benefit of CAD over conventional design. | (3) |
| 2 | a) Name three each software packages for Computer Aided Design (Modelling) and Computer Aided Analysis. | (3) |
| | b) List any six user interaction devices used in CAD system. | (3) |
| | c) Define IGES? Describe its file structure. | (4) |
| 3 | a) Explain the basic transformations in CAD? | (3) |
| | b) A rectangle of length 60 mm and width 30 mm with left bottom vertex coinciding with the origin is to be transformed into a square with 90 mm sides having the origin coinciding with centroid of the square. Describe the transformations and sketch the both rectangles. | (7) |
| 4 | a) Write the transformation matrices for front view, top view and bottom view in orthographic projection. | (6) |
| | b) Briefly compare between the vector generation and raster in computer graphics. | (4) |

PART B

Answer any three full questions, each carries 10 marks.

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| 5 | a) Compare Synthetic curves with Analytic curves | (3) |
| | b) Identify the advantages of Bezier curves over cubic curves. | (5) |
| | c) Calculate the equation for tangent of a curve $y = 2x^2 + 3$ at a point $x=1$ | (2) |
| 6 | a) List the methods for generating curves. | (2) |
| | b) Briefly describe about synthetic surfaces? | (3) |
| | c) List the standard surfaces used for modelling and sketch any three. | (5) |
| 7 | a) Comment on solid modelling? | (3) |
| | b) List the method for solid modelling? | (3) |
| | c) With sketches describe constructive solid geometry method. | (4) |
| 8 | a) With the aid sketches give comparison between linear sweep and rotational sweep. | (6) |

- b) List and state four modelling tools in solid modelling. (4)

PART C

Answer any four full questions, each carries 10 marks.

- 9 a) Explain FEM? (2)
 b) List the various steps in FEM. (3)
 c) What is discretisation? Sketch two types elements each for one-dimensional and two-dimensional domains. (5)
- 10 a) Derive the shape function for one-dimensional linear element, plot its variation along the element. (4)
 b) The nodal values of displacements for a one-dimensional element are 3 mm and 7 mm respectively. Determine the displacements at $1/3^{\text{rd}}$ lengths of the element considering it as linear element. (2)
 c) In the above problem, if the displacement at midpoint of the element is given as 5 mm, determine the displacement at $2/3^{\text{rd}}$ length of the element considering it as quadratic element. (4)
- 11 a) Write the standard form of the discretised equation in FEM formulation, naming each term it. (3)
 b) Write the integral equation for element stiffness matrix with conventional notations. (2)
 c) Determine the stiffness matrix for a one-dimensional linear element of length 10 cm and cross-sectional area 1 square centimetre. Take $E=2 \times 10^5 \text{ N/mm}^2$ (5)
- 12 a) Elaborate about node connectivity matrix, what is its use? (4)
 b) Sketch a simple truss with seven members and five joints is given in Fig.1. Divide and number each element and node of the truss, considering each member as one-dimensional linear element. Also prepare the node connectivity matrix for this. (6)

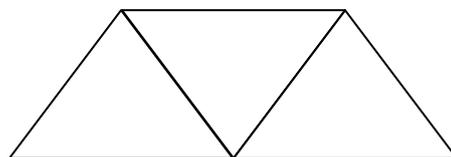


Fig.1

- 13 a) Enumerate and describe the types of elements used in two-dimensional domains? (5)
 b) Sketch and compare the CST and LST triangular elements. (5)
- 14 a) Define Iso-parametric elements. Sketch a general quadrilateral element in cartesian and map into a rectangular iso-parametric element in natural coordinates (7)
 b) Elaborate on Gauss quadrature method? where is it used in FEM? (3)